THE DISTRIBUTION AND LIFE HISTORY OF THE SKINK

HEMIERGIS PERONII (FITZINGER)

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[Read 11 July, 1968]

SUMMARY

Hemiergis peronii occurs from south-western Western Australia to south-eastern South Australia, but rarely inside the 12-inch isohyet and not in the Flinders or Mt. Lofty Ranges. Its northern limit is probably determined by aridity; its southern limit might be determined by the length of the winter.

H. peronii bears two to five living young in February. Females are inseminated in the autumn, when they are two years old. They ovulate in spring and do not bear their first young until they are three years old. Males first come into breeding condition when two years old.

H. peronii eats mostly arthropods and snails.

INTRODUCTION

Hemiergis peronii is a small, weak-limbed skink, very abundant in coastal dunes near Adelaide. Its reproductive cycle is unusual in that the females are inseminated in the autumn but do not ovulate until spring (Smyth and Smith, 1968). I now report some other details of its life history. They will provide a background against which the adaptive significance of the unusual reproductive cycle will perhaps become clearer, and they will slightly diminish our great ignorance about our native reptiles.

Some authors use *Hemiergis* as a sub-genus in the genus *Lygosoma*. *H. peronii* is called *L.* (*H.*) *quadridigitatum* Werner by Glauert (1961), probably for reasons which are explained and dismissed by Loveridge (1934). Worrell (1963) calls it *Lygosoma* (*Leiolopisma*) *peronii*.

METHODS

The distribution of *H. peronii* was mapped from the records of the South Australian, Western Australian, and Australian Museums and the Department of Zoology, University of Melbourne, from the published records of Werner (1910), Waite (1929), Loveridge (1934) and Mitchell and Behrndt (1949), and from my own collections and those made for me by a group of students of Naracoorte High School directed by Mr. D. Von Behrens.

The natural history was described from samples of from four to 16 lizards taken at two to four-weekly intervals for a year at Port Gawler and Middle Beach, about 30 miles north of Adelaide. Most of them were taken from under dead clumps of the lily *Dianella revoluta* R. Br. on shell-grit dunes behind the beach. The lizards were brought back to the laboratory and kept at 10°C until they were

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dissected. They were then measured with dividers, their reproductive organs removed and examined, their guts removed, the food taken out and identified, and the guts examined for parasites. The bodies were then preserved in buffered neutral formalin. The gut parasites are described by Angel and Mawson (1968).

DISTRIBUTION

H. peronii is confined to southern Australia, from south-western Western Australia to south-eastern South Australia (Fig. 1). It probably occurs in western Victoria as well, for according to Rawlinson (1966) there is a specimen in the National Museum, Melbourne, listed in the catalogue as from "Mallee district, Victoria". But it does not occur in southern Victoria, Tasmania, or the Bass Strait islands (Rawlinson, 1967). Lucas and Frost's (1894) claim that it has been taken in the Dandenong Ranges near Melbourne is probably mistaken, and Weekes's

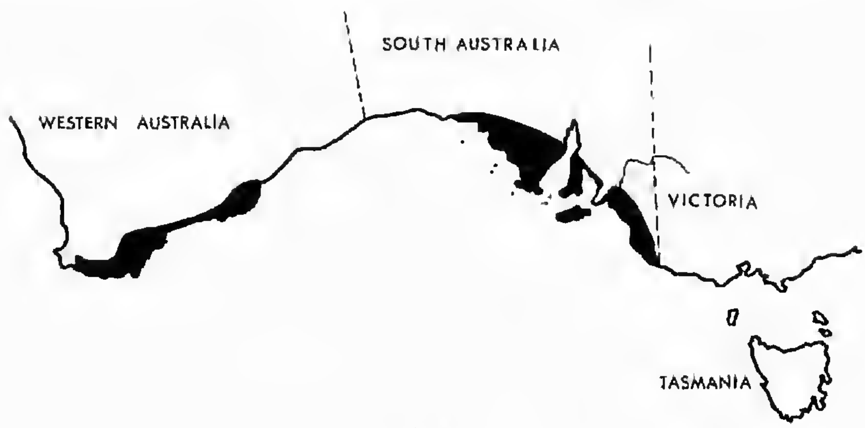

Fig. 1

(1930) claim that she took *Lygosoma* (*H.*) *quadridigitatum* at Tanara and Jenolan, New South Wales, is probably based on a wrong identification.

In Western Australia, *H. peronii* is found into the 50-60 inch rainfall belt near Northcliffe, but as far as we know at present its range does not extend right to the west coast. Loveridge (1934) does record a specimen from Perth, but this might have been the address of the collector rather than of the lizard. It has been taken as far inland as Fraser Range, in the 11-12 inch rainfall belt.

In South Australia, *H. peronii* is very abundant around much of the coastline (Fig. 2). It also occurs on many of the offshore islands, including St. Francis, Franklin, Flinders, Pearson, Greenly, Price, Black Rock, the South Neptune, and Wedge Islands. It occurs inland on sandy or skeletal calcareous soils on Eyre and Yorke Peninsulas, Kangaroo Island, and in the south-east of the State. Its distribution extends slightly inside the 12 inch isohyet only on the West Coast and near the head of St. Vincent Gulf (Fig. 2). It seems not to occur in either the Flinders or Mt. Lofty Ranges.

Further collecting will no doubt extend the known range of *H. peronii*. For instance, it might be found all the way around the Bight, and further into the Murray Mallee of South Australia.

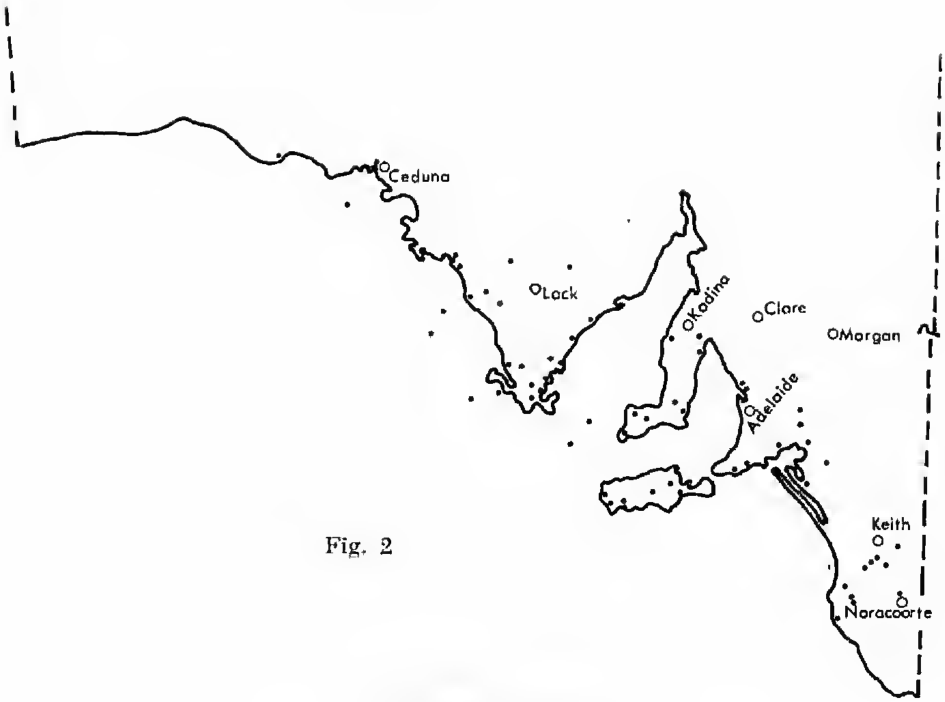

Fig. 2

REPRODUCTION

Male *H. peronii* come into breeding condition and inseminate the females in the later summer and autumn (Smyth and Smith, 1968). The sperm is stored in the female genital tract over winter; the females ovulate and their eggs are fertilized in the spring, between late October and the end of November. Two, three or four young are born at the end of February, larger mothers bearing on the average large litters.

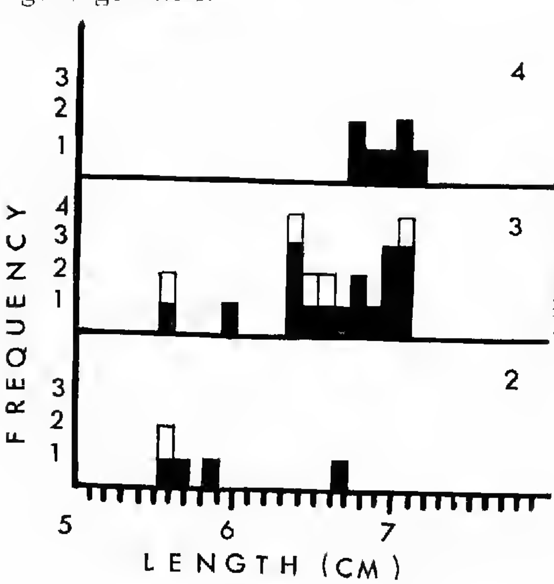

Fig. 3. The frequency distributions of snout-to-vent lengths of female *H. peronii* bearing two, three and four young. The number of young was counted from either large ovarian eggs (white) or eggs and embryos in the oviduct (black).

TABLE 1

Breeding condition of female *Hemiergis peronii*.

Date	Number of females with*				Total number
	developing follicles	ovarian eggs	oviducal eggs	no sign of reproductive activity	
16 November 1966			1	1	2
29 November			6	1	7
14 December			6	2	8
5 January 1967			3		3
25 January			5	6	11
15 February			4	3	7
1 March				5	5
14 March				2	2
28 March				9	9
12 April				2	2
25 April				8	8
10 May	6			2	8
24 May	4			1	5
13 June	6			1	7
18 June	4				4
18 July	1			1	2
18 August	2			1	3
19 September	2			1	3
3 October	6				6
17 October		5			5
31 October		2	2		4
21 November		2	2		4

* Females with no sign of reproductive activity included juveniles, one-year-olds, and, in March and April, older animals. Their ovarian follicles were small and transparent. Females were said to have developing follicles when the follicles became an opaque white, though they had enlarged very little if at all. Later, after the follicles had obviously begun to enlarge, the females were said to have ovarian eggs.

In *H. peronii* the right ovary is well anterior to the left in the body cavity, and the right oviduct is much longer than the left. About equal numbers of eggs are shed from each ovary but a high proportion migrates from the left ovary to the right oviduct. This is deduced from a comparison of the distribution of the corpora lutea between the two ovaries with the distribution of eggs and embryos between the two oviducts. Thus of 90 eggs shed from the ovaries of 29 females, 48 came from right ovaries, but 61 embryos developed in right oviducts and only 29 in the left. In only one of the 29 females was there more than one embryo in the left oviduct; in this case there were two in each. The most posterior egg was always in the left oviduct.

GROWTH AND AGE STRUCTURE

Figs. 4 and 5 show the distribution of snout-vent lengths of all individuals taken during the year. It can be shown from these figures that males first come into breeding condition, and females are first inseminated, when they are two years old. Females therefore bear their first young when they are about three years old. Consider the snout-vent lengths of females (Fig. 4); in April and May there are clearly two year-classes in which there is no follicular development. These have been delineated in Fig. 4; the lower group is of young of the year, the

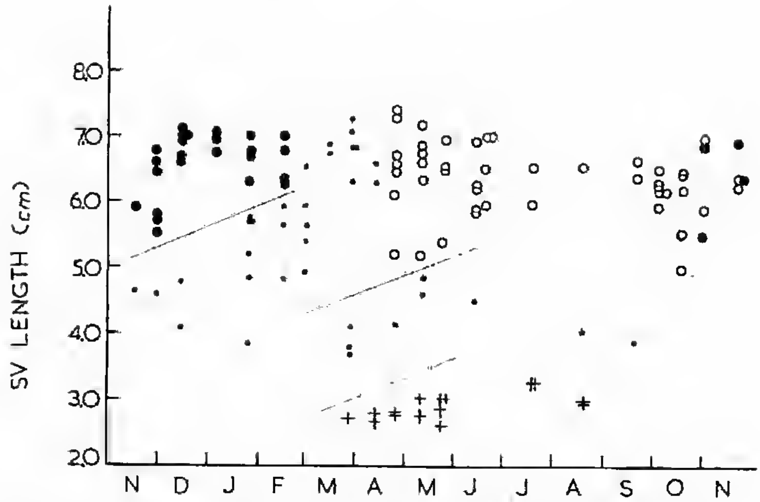

Fig. 4. The snout-to-vent lengths of all female *H. peronii* caught from November, 1965 to December, 1966. ● pregnant; • not pregnant, follicles undeveloped; ○ follicles visibly developing; + juvenile, sexes not distinguished.

upper group is of one-year-olds. Now consider the distributions for November, 1966 to February, 1967, when the females were pregnant. It is apparent that those females not pregnant must have belonged to these two youngest year classes. A somewhat similar argument can be applied to the males (Fig. 5). From February to May, when the testes of most males in the samples were enlarged, there were always some males with quite undeveloped testes; these were young of the year and, as well, larger animals which must have been one year old.

Neither the males nor the females, once they have reached sexual maturity, can be confidently separated into further year-classes, but it is likely that there are at least two year-classes of pregnant females in the summer, which by February will be three and four years old respectively. The larger females, probably approaching four years old, bear the largest litters (Fig. 3). Females grow to be longer than males.

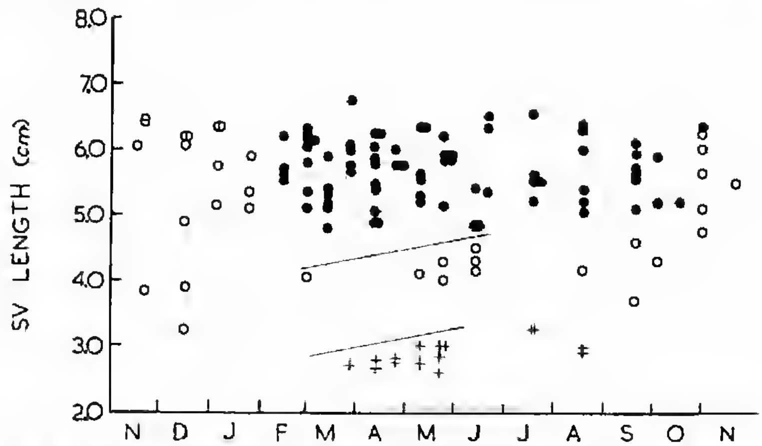

Fig. 5. The snout-to-vent lengths of all male *H. peronii* caught from November, 1965 to December, 1966. ● testis and/or epididymis contains sperm; ○ no sperm; + juvenile, sexes not distinguished.

FOOD

It was fairly easy to classify most arthropod foods to Order because at least the heads and usually other parts as well passed through *H. peronii* intact. But some other foods were probably missed. Land snails, for instance, were sometimes found without shells or with only a few fragments of shell adhering, which made them hard to notice. Also, the shells of land snails were probably sometimes confused with the small marine shells, mostly of gastropods and foraminifera, which made up much of the ground on which the lizards were living, and which often appeared in the lizards' guts. So the proportion of land snails in the diet was probably under-estimated.

The abundance of various items of food taken by male, female and juvenile *H. peronii* is shown in Table 2. Obviously *H. peronii* is almost exclusively insectivorous. The only plant food found more than once was the seeds of the lily *D. revoluta* under which most of the lizards were caught. These seeds are small, black and shiny, and might have been mistaken for insects. They were largely undigested.

TABLE 2

The diet of *Hemiergis peronii*.

Item	Numbers of each item			% of total		
	Males	Females	Juveniles	Males	Females	Juveniles
Beetles	100	133	6	28·3	29·9	7·1
Ants and other Hymenoptera	24	56	2	6·8	12·6	2·4
Cockroaches	30	23	3	8·5	5·2	3·6
Cockroach oothecae	15	25		4·2	5·6	
Moths	25	22		7·1	4·9	
Bugs (Hemiptera)	17	10		4·8	2·2	
Unidentified insect larvae	11	13		3·1	2·9	
Collembola	2	1		0·6	0·2	
Grasshoppers	2			0·6		
Flies	1			0·3		
Earwigs	1			0·3		
Ant-lions		1			0·2	
Mites	41	121	69	11·6	27·2	82·1
Spiders	13	10		3·7	2·2	
Pseudoscorpions	3		2	0·8		2·4
Slaters (Isopoda)	4	7		1·1	1·6	
Centipedes		1			0·2	
Snails	29	6	1	8·2	1·3	1·2
Lizards	2	1		0·6	0·2	
Seeds	21	15		5·9	3·4	
Unidentified	12		1	3·4		1·2
Total number of individual items	353	445	84			

The range of size of the foods taken was large, from small mites, mostly Oribatids, up to adult skinks *Ablepharus greyii* (Gray), which are about 4 cm long. Juveniles took only small items: there is very little difference between the foods of males and females. Most of the animals eaten were feeders in litter or on the surface.

INJURIES TO LIMBS

Several *H. peronii* had lost digits or parts of limbs. This would be no great handicap to them, since their movement is mainly by lateral undulations. Some of these members would have been lost in accidents; I found one *H. peronii* with an ant's head still firmly clamped onto its foreleg, though the limb distal to the ant's mandibles had withered and would soon have dropped off. In other cases, the members might have been lost by disease or fights.

Males and females apparently lost large portions of front and hind limbs with about equal frequencies, but in both sexes toes were missing much more often than fingers (Table 3). This suggests that digits and large portions of limbs are lost from different causes.

TABLE 3

Limb injuries in *Hemiergis peronii*.

		Male	Female
No. feet from which one or more digits were lost	front	5	5
	hind	24	20
No. limbs wholly or partly lost	front	6	4
	hind	4	0
No. animals with all members intact		66	73
No. animals examined		92	98

One *H. peronii* was found to have five fingers on each front foot, though the usual number is four. This anomaly is worth mentioning only because several species of *Hemiergis* are most easily distinguished on the basis of the number of their fingers and toes. Werner (1910) claimed that this was the only way he could separate them at all. Glauert (1961) mentions some other freak numbers of digits, and gives the impression that the number of digits is not a good specific character.

DISCUSSION

It is likely that the northern limit to the distribution of *H. peronii* is determined by aridity, for its powers to resist desiccation are relatively poor. Warburg (1966) has shown that its rate of evaporative water loss increases rapidly with increasing temperature, and that it quickly dies in a dry atmosphere at temperatures as low as 35°C.

The southern limits to its distribution might be determined by winter temperatures. Where winters are cold, lizards usually become torpid, and will become active again only in warm, sunny weather. Even then, they probably do not feed, for torpid cold reptiles with food in their guts are in mortal danger because they cannot digest the food, which then putrefies (Regal, 1966). I found food in the gut of *H. peronii* throughout the winter, so, though it certainly becomes less active, it probably does not become torpid for long. Also, abdominal fat bodies, which in some lizards are known to be important in over-winter metabolism (Dessauer, 1955), are absent in *H. peronii*, though they are prominent in some other local skinks.

So *H. peronii* might need to feed over winter in order to survive. If this is so, its preferred body temperature should be low. There is no information available on this, but Licht, Dawson, Shoemaker and Main (1966) have shown that the preferred body temperature of *H. quadrilineatum* is relatively low, and

H. quadrilineatum, like *H. peronii*, has a very high rate of evaporative water loss (Licht, Dawson and Shoemaker, 1966).

Why *H. peronii* does not occur in the Flinders or Mt. Lofty Ranges is hard to say. Over much of its range it occurs on sand; in the south-east, for instance, its range seems to coincide with the relict coastal dunes there (Sprigg, 1952). On parts of Eyre Peninsula it occurs on soils which, though not very sandy, are underlain by kunkar derived from old sand dunes. Perhaps *H. peronii* avoids soils prone to water-logging. But obviously a full analysis of its distribution requires much more detailed study.

ACKNOWLEDGMENTS

I wish to thank John Mitchell, Glen Storr, Harold Cogger, Peter Rawlinson, Dierk Von Behrens and students from Naracoorte High School, Michael Braysher, Meredith Smith, Vaal Nielsen, Beverley Jones, Stuart Harris and Lewis Chinner for help and advice.

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